INFLATION AND MACROECONOMIC VARIABLES: EVIDENCE FROM PANEL DATA

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ABSTRACT

Issues involving inflation has generated an enormous volume of literature and heated debate in recent years as different school of thoughts view the contrast cause and have different policies for fighting inflation. This study examines the relationship between selected independent variables and inflation and theory that can explain inflation in selected developed and developing countries of ASEAN and G7 countries using panel data analysis. The main variable of this study is money supply and unemployment. This study focus on the Quantity Theory of Money proposed by Irving Fisher and Phillips Curve. The issue that is brought forward is Keynesian's argument that Fisher's equation (MV=PT) is truism and only appropriate at full employment where it is impossible in the current situation. Hence, this employed study is to prove whether the Fisher's equation is appropriate in the long-run or short-run. The argument of the Phillips Curve flattening is brought forward by authors, stating that the curve is appropriate in the short-run. Therefore, the motivation of this study is to prove that the Fisher's Theory and the Phillips Curve is still appropriate in explaining inflationary problem. The empirical method to be employed are POLS regression, Granger Causality Test, Panel ARDL and Pooled Mean Group (PMG) estimation. The results from POLS regressions revealed that that money supply is significant to inflation (measured at CPI), and the Panel ARDL results indicate that the significance is for the long-run. There are two policy implications that is proposed in this study. First, the governments should put in place considerable reforms that will certify that the velocity of the supply of money in the market is constantly monitored and controlled. The central banks should also consider monetary policy as a suitable tool of achieving price stability because of the linear interdependency and causality between the price level and money supply growth. Second, the concerned policy makers as well as the government who are accountable for optimum level of inflation for sustainable growth and development should reduce the unemployment rate by opening more job opportunities for fresh graduates, although they are lack of job experience. This is to achieve the full employment rate in the economy.

Keywords: inflation; Phillips curve; panel ARDL; PMG

ABSTRAK

Isu-isu yang melibatkan inflasi telah menghasilkan banyak penulisan sastera dan perdebatan hangat dalam beberapa tahun kebelakangan ini kerana sekolah pemikiran yang berbeza melihat punca yang berbeza dan mempunyai dasar pemikiran yang berbeza untuk membanteras inflasi. Kajian ini mengkaji hubungan antara pemboleh ubah bebas yang dipilih dengan inflasi dan teori yang dapat menjelaskan inflasi di negara maju dan negara sedang membangun seperti ASEAN dan G7 dengan menggunakan analisis data panel. Pemboleh ubah utama kajian ini adalah pengaliran wang dan pengangguran. Kajian ini menumpukan pada Teori Kuantiti Wang yang dibawa oleh Irving Fisher dan Keluk Phillips. Isu yang dibawa ke hadapan adalah perdebatan para Keynesian bahawa persamaan Fisher (MV = PT) adalah *truism*, bermakna hanya berguna pada masa tertentu sahaja dan hanya sesuai di situasi pekerjaan penuh dimana ianya tidak mungkin dalam situasi sekarang. Oleh itu, kajian ini bermatlamat untuk membuktikan sama ada persamaan Fisher sesuai dalam jangka panjang atau jangka pendek. Hujah Keluk Phillips dibawa ke hadapan oleh penulis, menyatakan bahawa lengkungnya hanya sesuai dalam jangka pendek. Oleh itu, motivasi kajian ini adalah untuk membuktikan bahawa Teori Fisher dan Keluk Phillips masih sesuai untuk menjelaskan masalah inflasi. Kaedah empirikal yang digunakan ialah Regresi POLS, Ujian Kausaliti Granger, Panel ARDL dan Anggaran PMG. Hasil dari regresi POLS menunjukkan bahawa bekalan wang adalah penting kepada inflasi (diukur pada *CPI*), dan hasil Panel ARDL menunjukkan bahawa kepentingannya adalah untuk jangka masa panjang. Terdapat dua implikasi dasar yang dicadangkan dalam kajian ini. Pertama, kerajaan harus membuat pembaharuan yang akan memastikan bahawa hala tuju bekalan wang di pasaran sentiasa dipantau dan dikendalikan. Bank-bank pusat juga harus mempertimbangkan dasar monetari sebagai alat yang sesuai untuk mencapai kestabilan harga kerana terdapat hubungan linear dan kausaliti antara paras harga dan pertumbuhan bekalan wang. Kedua, pembuat dasar serta kerajaan yang bertanggungjawab untuk tahap inflasi yang optimum untuk pertumbuhan dan pembangunan yang mampan harus mengurangkan kadar pengangguran dengan membuka lebih banyak peluang pekerjaan untuk graduan baru, walaupun mereka kurang pengalaman pekerjaan. Ini adalah untuk mencapai kadar pekerjaan penuh dalam ekonomi.

Kata kunci: inflasi; keluk Phillips; panel ARDL; PMG

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List of Abbreviations

CPI	Consumer Price Index
MS	Money Supply
UEP	Unemployment
RIR	Real Interest Rate
MFG	Manufacturing
RER	Real Exchange Rate
GDP	Gross Domestic Products
MW	Money Wages
IMP	Import of Goods and Services
ADF	Augmented Dickey Fuller
ASEAN	Association od Southeast Asian Nation
G-7	Group of Seven Developed Countries
ECM	Error Correction Model
POLS	Pooled Ordinary Least Squares
ARDL	Autoregressive Distributed Lag

PMG Pooled Mean Group

OPEC Organization of Petroleum Exporting Countries

Glossary of Terms

ASEAN-6:

Malaysia, Thailand, Vietnam, Indonesia, Phillipines, Brunei

G-7 (Group of Seven Developed Countries):

United States, United Kingdom, Japan, Italy, France, Canada, Germany

(Singapore was opted from the ASEAN countries to be in the Developed Countries)

CHAPTER 1
INTRODUCTION

1.1 Introduction

This chapter elaborates on the overview of this research paper. Firstly, there are an overview on inflation in ASEAN and G7 countries. The chapter follows up with research background, problem statement, research questions, research objectives, hypothesis of the study, significant of the study and limitations of the study. The chapter ends with concluding remarks.

1.2 Overview of Inflation

One of the unanimity views among economists is the importance of low and stable inflation levels in an economy. Economic theory assures us low and stable inflation is important for market-driven growth, and that monetary policy is the most direct tool for controlling inflation. Inflationary issues had been debated throughout numerous literatures and research projects through these years. The debates differ in their hypotheses, mainly due to a range of conventional views about the appropriate measure to control inflation and also due to disparity between developed and developing countries. Evidences to prove the cause and effect of inflation is being poured by different school of thoughts, from classical, Keynesian, monetary to structural. It is vital to study inflation in each country because inflation is peaking throughout countries, regardless of developing or already developed countries. Inflation creates imbalance in the efficiency of the economy that affects economic growth of a particular country. A more accurate solution or method to control inflation is necessary as wrong diagnosis of the root problem may lead to adverse effects that may bounce back on the economy.

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APPENDIX

APPENDIX A

Panel Regression – Fixed Effect Model (FEM) for Developed Countries

Dependent Variable: CPI
Method: Panel Least Squares
Sample (adjusted): 1991 2016
Periods included: 26
Cross-sections included: 7
Total panel (unbalanced) observations: 153

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	74.24039	5.663894	13.10766	0.0000
MS	0.261150	0.033683	7.753192	0.0000
UEP	-0.798527	0.438303	-1.821861	0.0706
RIR	-2.082240	0.319260	-6.522085	0.0000
MFG	-0.156803	0.130443	-1.202076	0.2313

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.619239	Mean dependent var	92.60467
Adjusted R-squared	0.592425	S.D. dependent var	12.60257
S.E. of regression	8.045687	Akaike info criterion	7.077329
Sum squared resid	9192.096	Schwarz criterion	7.295204
Log likelihood	-530.4157	Hannan-Quinn criter.	7.165834
F-statistic	23.09372	Durbin-Watson stat	0.458106
Prob(F-statistic)	0.000000		

*Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively*

Table A FEM Regression Analysis

$$Y_{IT} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_t$$

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_4 RIR_t + \varepsilon_t$$

$$CPI = 74.24 + 0.26MS - 0.80UEP - 0.16MFG - 2.08RIR + \varepsilon_t$$

Based on the result generated on FEM for the developed countries, the results are presented at *Table A*. The FEM result shows that variables MS, UEP and RIR tested is found to be significant under the probability of below 10%. At the probability below 1%, the independent variables of money supply, unemployment and RIR shows a significant t-statistic of 7.753192, -1.821861 and -6.522085 respectively. The t-statistic of manufacturing is insignificant as the probability is above 10% (0.2313 @ 23.13%). This shows that there is a positively significant relationship between money supply and CPI. There are also negative significant relationship between unemployment and RIR with CPI.

APPENDIX B

Panel Regression – Fixed Effect Model (FEM) for Developing Countries

Dependent Variable: CPI
Method: Panel Least Squares
Sample (adjusted): 1991 2016
Periods included: 26
Cross-sections included: 6
Total panel (unbalanced) observations: 143

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-108.4786	17.82858	-6.084533	0.0000
MFG	-0.530204	0.257855	-2.056207	0.0418
GDP	1.473350	0.453968	3.245496	0.0015
RER	0.004253	0.000757	5.619382	0.0000
IMP	-0.549633	0.104751	-5.247035	0.0000
MS	-0.409915	0.093597	-4.379570	0.0000
MW	4.135354	0.357806	11.55754	0.0000
UEP	-1.546475	0.829362	-1.864657	0.0645

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.873821	Mean dependent var	80.77100
Adjusted R-squared	0.862174	S.D. dependent var	29.50850
S.E. of regression	10.95501	Akaike info criterion	7.711980
Sum squared resid	15601.61	Schwarz criterion	7.981329
Log likelihood	-538.4066	Hannan-Quinn criter.	7.821430
F-statistic	75.02363	Durbin-Watson stat	0.714829
Prob(F-statistic)	0.000000		

*Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively*

Table B FEM Regression Analysis

$$Y_{IT} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_t$$

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + +\beta_3 MFG_t + \beta_4 RER_t + \beta_5 GDP_t + \beta_6 MW_t + \beta_7 IMP_t + \varepsilon_t$$

$$CPI = -108.48 - 0.41MS - 1.54UEP - 0.53MFG + 0.004RER - 1.47GDP + 4.14MW - 0.55IMP + \varepsilon_t$$

Based on the result generated on FEM for the developing countries, the results are presented at *Table B.* The FEM result shows that all the variables tested is found to be significant and below the probability of below 1% and 10%. The independent variables of GDP, real exchange rate and money wages show a positively significant relationship with CPI. Besides, the independent variables of manufacturing, money supply, import and unemployment show a negatively significant relationship with CPI.

APPENDIX C

Granger Causality Test – Developed Countries

Null Hypothesis:	Obs	F-Statistic	Prob.
MS does not Granger Cause CPI	280	0.97825	0.3773
CPI does not Granger Cause MS		3.52323	0.0308**
UEP does not Granger Cause CPI	192	0.26695	0.7660
CPI does not Granger Cause UEP		9.46784	0.0001***
RIR does not Granger Cause CPI	235	3.51820	0.0313**
CPI does not Granger Cause RIR		8.34564	0.0003***
MFG does not Granger Cause CPI	184	6.34945	0.0022***
CPI does not Granger Cause MFG		19.1160	3.E-08
UEP does not Granger Cause MS	192	0.78335	0.4584
MS does not Granger Cause UEP		0.44020	0.6446
RIR does not Granger Cause MS	235	0.07984	0.9233
MS does not Granger Cause RIR		1.24198	0.2907
MFG does not Granger Cause MS	184	0.17242	0.8418
MS does not Granger Cause MFG		0.39580	0.6737
RIR does not Granger Cause UEP	168	2.23631	0.1101
UEP does not Granger Cause RIR		3.14119	0.0459**
MFG does not Granger Cause UEP	162	5.40055	0.0054***
UEP does not Granger Cause MFG		2.93627	0.0560**
MFG does not Granger Cause RIR	161	1.45935	0.2355
RIR does not Granger Cause MFG		2.26493	0.1072

*Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively*

APPENDIX D

Granger Causality Test – Developing Countries

Null Hypothesis:	Obs	F-Statistic	Prob.
MFG does not Granger Cause CPI	194	1.46803	0.2330
CPI does not Granger Cause MFG		4.81049	0.0092***
GDP does not Granger Cause CPI	205	0.20095	0.8181
CPI does not Granger Cause GDP		0.03090	0.9696
RER does not Granger Cause CPI	210	0.89251	0.4112
CPI does not Granger Cause RER		5.58954	0.0043***
IMP does not Granger Cause CPI	210	0.43068	0.6507
CPI does not Granger Cause IMP		1.58651	0.2071
MS does not Granger Cause CPI	174	4.45934	0.0130***
CPI does not Granger Cause MS		10.5645	5.E-05
MW does not Granger Cause CPI	148	2.65539	0.0737*
CPI does not Granger Cause MW		0.17078	0.8432
UEP does not Granger Cause CPI	144	0.27612	0.7591
CPI does not Granger Cause UEP		1.68746	0.1888
GDP does not Granger Cause MFG	194	1.06178	0.3479
MFG does not Granger Cause GDP		0.11109	0.8949
RER does not Granger Cause MFG	194	1.68635	0.1880
MFG does not Granger Cause RER		0.45684	0.6340
IMP does not Granger Cause MFG	194	0.58787	0.5565
MFG does not Granger Cause IMP		4.75028	0.0097***
MS does not Granger Cause MFG	174	0.64875	0.5240
MFG does not Granger Cause MS		4.96119	0.0081***
MW does not Granger Cause MFG	148	4.80126	0.0096***
MFG does not Granger Cause MW		2.32451	0.1015
UEP does not Granger Cause MFG	144	0.58370	0.5592
MFG does not Granger Cause UEP		1.22586	0.2967
RER does not Granger Cause GDP	205	3.60056	0.0291**
GDP does not Granger Cause RER		1.43802	0.2398
IMP does not Granger Cause GDP	205	0.70722	0.4942
GDP does not Granger Cause IMP		4.99369	0.0077***
MS does not Granger Cause GDP	174	0.03037	0.9701
GDP does not Granger Cause MS		4.51635	0.0123***
MW does not Granger Cause GDP	148	8.18148	0.0004***
GDP does not Granger Cause MW		4.41640	0.0138***

UEP does not Granger Cause GDP	144	0.07750	0.9255
GDP does not Granger Cause UEP		2.89123	0.0589**
IMP does not Granger Cause RER	210	1.20451	0.3020
RER does not Granger Cause IMP		3.27466	0.0398**
MS does not Granger Cause RER	174	0.50664	0.6034
RER does not Granger Cause MS		3.11740	0.0468**
MW does not Granger Cause RER	148	1.04128	0.3557
RER does not Granger Cause MW		10.3666	6.E-05
UEP does not Granger Cause RER	144	0.10418	0.9011
RER does not Granger Cause UEP		0.53463	0.5871
MS does not Granger Cause IMP	174	1.97444	0.1420
IMP does not Granger Cause MS		0.44491	0.6416
MW does not Granger Cause IMP	148	1.94808	0.1463
IMP does not Granger Cause MW		0.11848	0.8884
UEP does not Granger Cause IMP	144	1.02137	0.3628
IMP does not Granger Cause UEP		1.09831	0.3363
MW does not Granger Cause MS	134	8.32388	0.0004***
MS does not Granger Cause MW		0.95196	0.3887
UEP does not Granger Cause MS	130	2.35478	0.0991*
MS does not Granger Cause UEP		0.11002	0.8959
UEP does not Granger Cause MW	144	0.14564	0.8646
MW does not Granger Cause UEP		1.80855	0.1677

*Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively*